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Permian to Juratriassic times. For the former we are as yet poorly off for data, especially in Algonkian times; for lower Cambrian I send the student to Walcott's map in Bulletin No. 61 of the United States Survey, showing the occurrence of lower, middle and upper Cambrian deposits at various points; or better reproduce the map and show on it at the same time the Archæan exposures, so that it may be evident in what basin or valley each Cambrian section lies; then the mapping of the continent, first in earlier Cambrian and then in later Cambrian times, presents a very instructive picture to the mind's eye of the waters returning from their long retreat, after Algonkian times, into the ocean basins and gradually encroaching upon the continent, first filling the valleys along the borders, and finally invading the heart of the continent itself. The retirement of the waters in later Carboniferous and Permian times is an equally interesting spectacle.

Nor is the mere mapping of the land and water all that can be done. The question will arise as to what sort of a land it was: was it level or mountainous? How high did the Rocky Mountain islands and other lands rise above the sea? Such questions can be answered approximately at least by a study of the sections if they are carefully drawn. The student will discover, for instance, that the Archæan rocks of Nevada towered up high enough not to be submerged by the 30,000 feet or more of Palæozoic sediments that were deposited in the valleys to the eastward; in other words that mountains higher than any now existing lie buried under the modern Sierras. The student may represent these on his Palæozoic maps and indicate their gradually decreasing height from period to period.

Something, also, can be done at locating the old drainage systems of these early continents. In many cases it will evidently be safe to infer that the modern rivers are in the same old channels, especially in driftless regions; in other cases the pre-glacial history of rivers has been made out; a map of the pre-glacial drainage of the great lake region, like that in the *American Geologist* for Feb., 1891, for example, may be reproduced and hung on the wall, where it may be used in locating the probable course of the rivers of that region, in the various periods with which the class has to deal.

I wish that some one who is competent to do it would give us a handbook of elementary geology, which should consist largely in the presentation, by means of maps, sections, rock columns, tables and text, of such facts as the student could use in developing by laboratory methods his own "geological story briefly told."

THE BASIS OF SPELLING REFORM.

BY A. MELVILLE BALL, WASHINGTON, D. C.

MANY efforts have been made, and renewed from time to time, to correct the anomalies of English spelling; but, for the most part, these efforts have been resultless, except to intensify the prevailing sense of needed amendment. Strangely enough, the first requisite for any improvement in spelling has generally been lost sight of—namely the improvement of the ALPHABET. We have to write *g*, we have to write *h*, we have to write *n*, we have to write *s*, we have to write *t*, in thousands of cases where there is no *g*, *h*, *n*, *s*, or *t* to be pronounced. On account of a defective alphabet we are compelled to use unsounded letters to denote unrepresented sounds. For example, the consonant in the syllable *ing* has neither *n* nor *g* in its sound; the consonant in the syllable *ish* has neither *s* nor *h* in its sound; the consonants in the words *oath* and *they* have neither *t* nor *h* in their sounds; and these two sounds,—while as different from each other as *s* and *z*, *f* and *v*, *p* and *b*,—are both denoted by the same

letters, *th*. With such glaring defects in the alphabet, any attempt to improve orthography by merely dropping redundant letters is but trifling with the subject. A workman must have appropriate tools, yet we expect our literary workman to dispense with a large proportion of his most necessary implements, and to spell forty sounds with little more than half that number of letters. We must commence our spelling reform by providing the means of writing our unrepresented sounds. Of these there are six, among consonants, as heard in the words

sing, wish, pleasure, oath, they, why.

When we shall have furnished the alphabet with representative letters for these elementary sounds it will be time enough to attend to the minor discrepancies in the writing of vowels. All the amendment that can be hoped for in the latter respect—without multiplication of new letters—will be brought about by the application of one rule, namely: OMIT ALL PHONETICALLY DISPENSABLE, OR SILENT, LETTERS. This rule will, without specific detail, take *a* from *head*; *e* from *have* and *give*; *i* from *friend*; *o* from *foff* and *people*; *u* from *build*, etc. The rule has thus the advantage of simplicity and comprehensiveness, so that it may well take the place of the twenty-four rules of the philological societies, which only amount to the same precept "writ large."

Of the two classes of faults in spelling—deficiency and redundancy of letters—the former is by far the more serious and should be first rectified. Redundancies can be dropped at any time.

The one only drawback that can be urged against extension of the alphabet is that printers will require six additional types. But this objection is neutralized by the consideration that the trifling expense of additional types will be largely offset by the working economy of making six letters do the present duty of twelve.

The new consonant letters may be so designed that they will make but little alteration in the aspect of words, and so will be intelligible at a glance to every reader. The suggested forms introduced in WORLD-ENGLISH exemplify this fact, but in that system every word is made phonetic for "World" use. The present proposal limits inaugural improvement to the provision of letters for unrepresented sounds. Other improvements may safely be left to work themselves out by degrees, but there can be no radical improvement in spelling while we lack letters to represent one-fourth of the consonants in our language.

The attention of Congress has recently been again called to this subject; therefore the movement is opportune for its discussion. Let America take the initiatory step, and Great Britain and the English-speaking world will follow. The "initiatory step" will consist simply in an enactment that the Public Printer shall henceforth use prescribed forms of single letters to represent the six simple sounds enumerated above; and that he shall discontinue the use of the double letters now employed for the same purpose.

This is the true basis of SPELLING REFORM.

—Sydney H. Vines, Fellow of Magdalen and Sherardian Professor of Botany in the University of Oxford, is about to issue a "Student's Text-book of Botany," based upon Professor Prantl's "Lehrbuch der Botanik," but with the scope of the work so extended that, while retaining all that has made it of value to beginners, it will be more useful to those engaged in advanced study. The number of pages has been doubled by additions to all four parts of the book, but more especially to Part III., dealing with the classification of plants. The whole book, moreover, has been so revised as to render the present essentially a new and distinct work.